

CORPORATE CASH HOLDINGS: STUDY OF CHINESE FIRMS

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Abstract

This study focuses on the determinants of cash holdings in the period of 2003-2012 for Chinese manufacturing industry and how Chinese firms manage cash holdings. In general, when firms are more financially constrained, they are more likely to hold more cash. According to our investigation, firms with lower leverage, less net working capital (NWC), and lower capital expenditures, are more likely to increase cash holdings. In addition, China has different economic environment from developed countries, most of manufacturing firms are state owned; thus, the government policies influence the motivations of firms.

Keywords: Cash holdings; Cash flow; Cash ratio; China

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1. Introduction

In this study, we document a trend of significant increase in cash holdings of Chinese firms for the period 2003-2012. The amount of cash held is one of the indicators of firm's operation and risk management. Sufficient cash holdings mean financial flexibility and liquidity for a firm. There is an optimal amount of cash that firms can hold in an account. Firstly, cash is a buffer for future uncertainty. Most firms hold cash due to precautionary motives. It is also an investment signal for creditors and investor because they prefer stable firms with positive cash flows. From investment point of view cheaper source of funding when there are financial constraints on raising external finance. Cash also guarantees firm's ability of pay back its debt. At the same time, holding excessive amounts of cash is costly. Free cash may create agency problems for the firm. Too much cash may result in the divergence of interests between shareholders and managers where managers use cash to pursue private benefits that do not maximize shareholders' wealth, e.g. an empire building. Second, large amount of cash holding could lead to lower level of inventory thus lower operational sales revenue. Also there is an opportunity cost to holding non-interest bearing assets on the balance sheet.

This paper examines the determinants of corporate cash holding for the Chinese manufacturing industry from 2003 to 2012. Bates *et al* (2009) document an increase in cash holding for firms in the US and examine their determinants. The existing literature, however, lags in studies of the determinants of cash holdings for developing countries

such as China. This study intends to cover the lag in the literature and to provide insights to the relationship between cash holding and the type of ownership.

The result shows the larger the firm is, the more cash they will hold. This can be explained that large firms are seeking expansion and thus they hold cash for their research and development. In addition, net working capital (NWC) demonstrates obvious inverse relationship with cash ratio. Furthermore, firms with lower leverage and less NWC are more likely to attain more cash. The influence of industry sigma (Tobin's Q) is not observable for Chinese firms. The correlation between Tobin's Q and cash ratio does not follow the result of the literatures. These results propose that Chinese firms hold cash for precautionary motives.

2. Literature Review

Since the 1990s, China began to transition toward a market-oriented financial strategy; the Chinese market has become increasingly important worldwide (Mookerjee and Yu 1995; Salvatore 2010). This paper is focused on how Chinese firms manage cash holdings and it aims to demonstrate the dominant influence of government on cash holdings.

In a world of perfect capital markets, holdings of liquid assets are irrelevant. If cash flow turns out to be unexpectedly low, such that a firm has to raise funds to keep operating and to invest, it can do so at zero cost. Since there is no liquidity premium in such a world, holdings of liquid assets have no opportunity cost. Hence, if a firm borrows money and invests it in liquid assets, shareholder wealth is unchanged.

Once we relax the assumption of perfect markets, holding cash in the account means liquidity for a company and ability of this company to pay back debt. Investors and lenders consider positive cash holding as a stable operation sign for a corporate company. On the other hand, holding cash in a bank account may become a conservative management sign for investors because company will miss investment opportunities instead of receiving interest from bank. Because of the time value of money, company will suffer lower financial return of liquid assets. Through analyses of the current literature and economic conditions in China, the determinants factors of cash holding can be classified as the followings briefly.

Agency problem is one of the motives for firms to hold cash. The interests of management are at the odds with that of shareholders. Too much cash might make management lax and encourage imprudent acquisition and expansion (Jensen, 1986). In general, management does not want to have the pressure of consistent payout on dividend. From the view of shareholders perspective, they do not like share buybacks because it means they are losing the ownership of the company. Poor shareholder protection cannot force managers to disgorge excessive cash balances. None of the evidence points to manager holding more cash simply because it is more difficult to access capital markets in countries with poor shareholder protection (Dittmar *et al.* 2003). Chinese stock market is influenced by government policy, thus the dividends payout is an issue to managers. Indeed, the agency costs are quite high in China (Feng and Johansson, 2011).

Transaction motive is another factor that influences firm's cash holding. Lower transaction cost is one of the main benefits from holding liquid assets. Firms save transaction costs to raise funds and does not have to liquidate assets to make payments. According to the Baumol (1952), transactions demand for cash will vary approximately in proportion with the money value of transactions. The demand for cash rises less than in proportion with the volume of transactions, so that there are, in effect, economies of scale from using cash. In order to avoid transaction cost, company use economies of scale to stock cash (Bates *et al.* 2009).

As most companies use cash as a risk management tool, they may have precautionary motives to hold cash. Cash provides buffer for uncertainty and against adverse cash flow shocks (Bates *et al.* 2009; Hugonnier *et al.* 2011). Almeida *et al.*

(2004) demonstrate theoretically that the cash flow sensitivity of cash, the systematic propensity to save cash out of cash flows, is positive in financially constrained firms. Developing countries have the similar conditions. Lian *et al.* (2011) find that Chinese firms hold relatively more cash for precautionary purpose due to the severe financial constraints as a result of imperfect capital market in China. The existence of influential insiders and controlling investors has made the situation worse (Feng and Johansson, 2011).

Research proposes that corporate cash holdings are mainly determined by business environments (operational determinants), by governance arrangements and agency conflicts. In the absence of agency conflicts, firms (in the neoclassical sense, where each firm operates as a single economic agent) will choose their cash holdings to maximize firm values given their underlying business environments. With regard to operational determinants, research indicates that firms that use more cash for payments and incur higher transactions costs from converting noncash financial assets to cash will hold more cash, to facilitate transacting (Baumol 1952; Miller and Orr 1966). Similarly, firms with relatively greater investment opportunities or those who face more costly or more constrained access to capital markets will also hold more cash, again, for operational reasons. These factors have been examined by, for example, Opler et al. (1999), Bates, Kahle, and Stulz (2009), and Duchin (2010).

On the basis of our review of the literature, we propose the following three hypotheses:

Hypothesis 1: Cash holdings are positively related to firm's investment opportunities as measured by Tobin's Q. Net working capital and capital expenses are negatively related to cash holdings as well.

Hypothesis 2: Chinese firms hold more cash during the crisis than in normal times.

Cash holdings are associated with firms' financial constraints status. Faulkender and Wang (2006) show that the marginal value of cash holdings is greater for financially constrained firms. Almeida et al. (2004) show that firms save cash out of current cash flow when they are financially constrained or are concerned about possible underinvestment in the future. Moreover, Almeida et al. (2004) built model using numbers of manufacturing firms to estimate the cash flow sensitivity of cash. Manufacturing is one of the largest industries in China, this model could be implies to China's corporate after testing.

Hypothesis 3: Chinese firms differ from enterprises in developed countries in that the national government has a dominant influence over them. The higher the level of government ownership in Chinese firms, the lower the firm value since the government will try to extract private benefits of control based on its relatively large ownership of firms. The higher the degree of government ownership in Chinese firms, the higher the likelihood of holding relatively higher levels of cash.

According to LaPorta et al. (1999), firms controlled by large shareholders can encounter agency problems which pit the controlling shareholder against other minority shareholders. The controlling shareholder attempts to maximize his welfare by influencing the decision of management. When the controlling shareholder's interests are

perfectly aligned with the interests of outside investors, then the outside investors benefit when the controlling shareholder takes actions which maximizes his welfare. However, when the interests of the controlling shareholder and outside investors are not perfectly aligned, then agency problems arise causing the controlling shareholder to maximize his welfare while at the same time harming the interests of outside investors. The benefits that the controlling shareholder extracts at the expense of other investors are referred to as the private benefits of control. The level of such benefits is in large part dependent on how well the interests of outside minority investors are protected in the firm's country. It should be noted that as a controlling shareholder obtains more private benefits, the outside investors' assessment of firm value falls.

In China, the government is the controlling shareholder in a large number of Chinese firms. There are over 2 million private enterprises in China, and 500,000 state-owned and collective enterprises. State-owned enterprises are firms with over 50 percent state ownership. Conflicts often arise between firms and politicians because the government wields control through its partial ownership of commercialized enterprises (Shleifer and Vishny 1994). According to Shleifer and Vishny, state-assigned managers may act in the interest of the politicians who control them rather than the interests of the firms.

As discussed, Almeida *et al.* (2004) argue that the cash flow sensitivity of cash, the systematic propensity to save cash out of cash flows, is positive for financially constrained firms. This phenomenon is stronger in a recession. Accordingly, we replace the level of cash holdings by the changes in cash and test the above three hypotheses

regarding the determinants to cash holdings in China. The next section discusses the data used in this study and our research methodology.

3. Methodology

3.1 Sample and data description

For the purpose of this study, we extract data from 1406 public firms' financial reports from ORBIS, and then define nine variables to explore the relationships between cash holding and other financial variables such as leverage, R & D, etc. We use average cash to assets ratio to measure cash holding variable. The finding is similar to US firms', which indicates Chinese firms are increasing their cash holding as well. There are a few variables are particular important. First, the net working capital, the noncash components of working capital can be converted into cash quickly. Secondly, cash flow are positively related to risk, the increase in risk has a substantial impact on cash holdings. That's why, during the financial crisis, firms tend to hold more cash. The last one is the capital expenditure which has a negative correlation with cash holdings.

In 2006, China issued The New Accounting Standards, which to a great extent reflects the convergence of the International Financial Reporting Standards. Before that the accounting standards between China and the US has a great deal of difference. We think that is the main reason why there are few data available on the website before 2006. We focus the analysis on period from 2006 to 2012. In China specifically, a large percentage of corporate equity is state owned which means government is the controlling shareholders. The operational and financial goals of state-owned firms maybe very different from those of privately owned firms, e.g. state owned firms may not be maximizing profits. State owned firms are great influenced by fiscal and monetary

policies to satisfy the overall economic objectives of the government. Thus some variables may have different effect on cash holding when compared to the result for developed countries such as the U.S, i.e. that Chinese firms are conservative and exercise precaution in cash management.

This study investigates the determinants of Chinese firm's cash holdings for the period from 2006 to 2012. We collect data from firms' financial statements and ownership from the database ORBIS¹. We require that firms have positive cash ratio in the given time period. We exclude financial industry as they hold cash for capital requirements instead of economic reasons. We also remove service industry from the observations because their financial factors are not what we are looking for. We only focus on manufacturing industry; and we generate a table, which contains 8 financial factors of 1406 companies and 6462 observations. In addition, to minimize the influence of extreme outliers, we follow the literature review and key variables at the 1st and 99th percentiles.

In this study, we also use firm size as a control variable and we further control for industry and year effect. Small firms are not as diversified as large firms, in terms of markets and products. This tends to suggest more risk for small firms in comparison with large firms under the normal times, let alone during the financial crisis. Moreover, it is well recognized that high tech and service companies tend to have fewer tangible assets that can be used as collateral. Their demand for cash is therefore higher than the other industries (Duchin *et al.* 2010).

¹ ORBIS is a global database containing detailed information on global companies.

3.2 Methodology

Primarily, we focus on the regressions using cash to asset ratio as dependent variable. Then we re-estimate the regressions using the logarithm of cash to asset ratio as dependent variable. This controls for possible non-linearities in the relationship between cash holdings and the independent variable. The independent variables we used to explain the relationship between determinants and cash holdings are as follows:

1. Tobin's Q ratio: we selected Tobin's Q as the independent variable in order to investigate investor detection of earnings manipulation. Tobin's Q is a measure of investment opportunities. We expect cash holdings, as well as cash flow sensitivities, to increase with Tobin's Q.
2. Firm size. There are economies of scale to holding cash. We take log of the total asset to measure size of firms.
3. Cash flow to assets. We measure cash flow as earnings after interest, cash dividends and tax. We take cash or cash equivalent divided by value of total asset.
4. Net working capital. Net working capital is the assets that substitute for cash. We assume net working capital has a negative relationship with cash holdings.
5. Capital expense to assets. Capital expenditure is measured by the ratio of capital expense to book value of asset. CAPEX is positively related to cash holdings. According to Riddick and Whited (2009) research, productivity shock will cause increase in investment and temporarily less cash savings.
6. Leverage. Leverage is the long-term debt plus debt dividend by book assets. Most companies use leverage to invest or operate. However, it comes with more risk. Thus for firms with constrained debt, there is a negative relationship between leverage and

cash holdings.

7. Industry sigma. Industry sigma, which is industry cash flow, is the mean of deviations of cash flow over assets in the 10 years. Companies with higher industry cash flow risk tend to hold more cash for precautionary motives.
8. R&D: research and development as a parameter to measure the growth opportunities of firms. In general, R&D activities consume cash. In order to run R&D, firms need to hold sufficient money. Thus R&D is positively related to cash holdings.

Based on the variables listing above, we run two regressions to testify the determinants on cash holdings:

$$\frac{\text{Cash Holding}}{\text{Total Assets}} = \alpha + \beta_1 * X_1 + \beta_2 * X_2 + \beta_3 * X_3 + \beta_4 * X_4 + \beta_5 * X_5 + \beta_6 * X_6 + \beta_7 * X_7 + \beta_8 * X_8 + \varepsilon \quad (1)$$

$$\log\left(\frac{\text{Cash Holding}}{\text{Total Assets}}\right) = \alpha + \beta_1 * X_1 + \beta_2 * X_2 + \beta_3 * X_3 + \beta_4 * X_4 + \beta_5 * X_5 + \beta_6 * X_6 + \beta_7 * X_7 + \beta_8 * X_8 + \varepsilon \quad (2)$$

Where

X_1 is Tobin's Q ratio to measure stock valuation

X_2 is parameter to measure size of the firms

X_3 is cash flow to asset ratio

X_4 is parameter of net working capital

X_5 is CAPEX

X_6 is leverage

X_7 is industry sigma

X_8 is research and development expense

4. Summary statistics

We list the definition of key variables in Table 1 and the statistics of key variables in Table 2 and Table 3.

Table1. Definition of key variables

Variable	Usage	Description
CASH RATIO	Cash	Cash and cash equivalent divided by Total asset
TOBIN'S Q	Long-term growth	Enterprise value divided by Total asset
FIRM SIZE	Size	Log of Total asset
CASH FLOW	Cash flow	Cash flow divided by Total asset
NWC	Liquid asset substitutes	Net working capital divided by Total asset
CAPITAL EXPENDITURE	Investment	Additions to fixed asset divided by Total asset
LEVERAGE	Leverage ratio	Total liability and debt divided by Total asset
INDUSTRY SIGMA	Volatility of cash flow	Volatility of an industry's cash flow divided by a 10-year period
R&D	Research and development	Research and development expense divided by Total asset

Table 2 provides summary statistics for our sample. The sample consists of 6462 firm-year observations from 1406 non-financial firms listed on Chinese domestic exchange from 2003 to 2012. The descriptive statistics include: cash ratio, log of cash ratio, Tobin's Q, firm size, cash flow ratio, net working capital ratio, capital expenditure ratio, and leverage ratio, research and development expense ratio. Result included are the mean, median, standard deviation, the minimum, the maximum and the 25th, 50th and 75th percentiles. Because firms vary in size, to normalize data, we use total asset to divide

each independent variables. Our main variable in the analysis, cash holdings has a mean of 0.32 and a median of 0.18 with a standard deviation of 46%. Because of the skewness of the variable, we use the log of cash holdings.

Table2. Statistics of key variables

Variables	Mean	Median	Std	Min	Max	P25	P50	P75
N	6462	6462	6462	6462	6462	6462	6462	6462
CASH RATIO	0.320	0.184	0.464	0.000	7.213	0.057	0.097	0.149
LOG CASH RATIO	-0.745	-0.735	0.488	-4.239	0.858	-1.348	-1.107	-0.939
TOBIN'S Q	1.312	0.864	7.315	-0.500	578.119	0.229	0.449	0.680
FIRM SIZE	5.614	5.533	0.595	2.285	8.538	4.960	5.167	5.345
CASH FLOW	0.177	0.059	9.472	-20.012	761.231	-0.032	0.008	0.030
NWC	-0.019	-0.009	0.252	-6.059	0.906	-0.317	-0.193	-0.112
CAPEX	-0.061	-0.045	0.057	-0.611	0.000	-0.141	-0.102	-0.079
LEVERAGE	0.568	0.519	1.684	0.018	123.982	0.212	0.324	0.416
R&D	-8.41E-04	0.00E+00	7.27E-03	-2.03E-01	2.82E-03	-3.37E-03	-1.68E-03	-1.12E-03

Table 3 briefly describes correlations among each variable. There is no remarkable relationship between the independent variables. But NWC has a significant inverse relationship with cash ratio/log cash ratio. The table presents Tobin's Q has a negative correlation with cash ratio/log cash ratio. This result does not obey the studies in the literature. To study the time influence to these variables, we made a correlation for each year (Appendix A). The trends of correlations are very similar for large sample. We will discuss these relations in detail in the following parts.

Table3. Correlation matrix of key variables

	CASH RATIO	LOG CASH RATIO	TOBIN'S Q	FIRM SIZE	CASH FLOW	NWC	CAPEX	LEVERAGE	INDUSTRY SIGMA	R&D
CASH RATIO	1.000									
LOG CASH RATIO	0.700	1.000								
TOBIN'S Q	-0.024	-0.034	1.000							
FIRM SIZE	-0.131	-0.041	-0.129	1.000						
CASH FLOW	-0.002	0.004	0.981	-0.068	1.000					
NWC	-0.591	-0.568	0.002	0.026	-0.001	1.000				
CAPEX	0.059	-0.018	0.020	-0.117	0.004	0.118	1.000			
LEVERAGE	-0.074	-0.087	0.909	-0.070	0.906	-0.096	0.042	1.000		
INDUSTRY SIGMA	-0.061	-0.102	0.008	-0.101	-0.006	0.066	0.028	-0.013	1.000	
R&D	-0.129	-0.082	0.016	-0.021	0.001	0.096	-0.022	0.005	0.060	1.000

5. Results and interpretation

In Table 4 we illustrate mean and median cash and leverage ratio in order to see the relationship between cash holdings and debt. The second column of table reports the number of sample firms for each year. We measure the cash ratio as cash and cash equivalents divided by total assets. The third column summarizes the aggregate cash ratio for each year is the sum of the cash holdings of all the firms divided by the total assets of all the firms. The next two columns reproduce the average and median cash ratio for each year. For the reason that 2003-2005 there are too few observations, we only take the observations from 2006 to 2012 for our estimation. From 2006 and 2012, the aggregate cash ratio reached the peak at 2010 of 15.22% as the average cash ratio and median cash ratio. For the next step, we intend to turn to the application of the trend of cash ratio changing to leverage. So the sixth column shows the average leverage ratio which is the totally liabilities divided by total asset for each firm of each year. We run a regression on the average cash ratio and average leverage ratio for each year (Appendix B). The coefficient is -0.26081 and has a p-value less than 0.05. However, the regression is only useful for the same period.

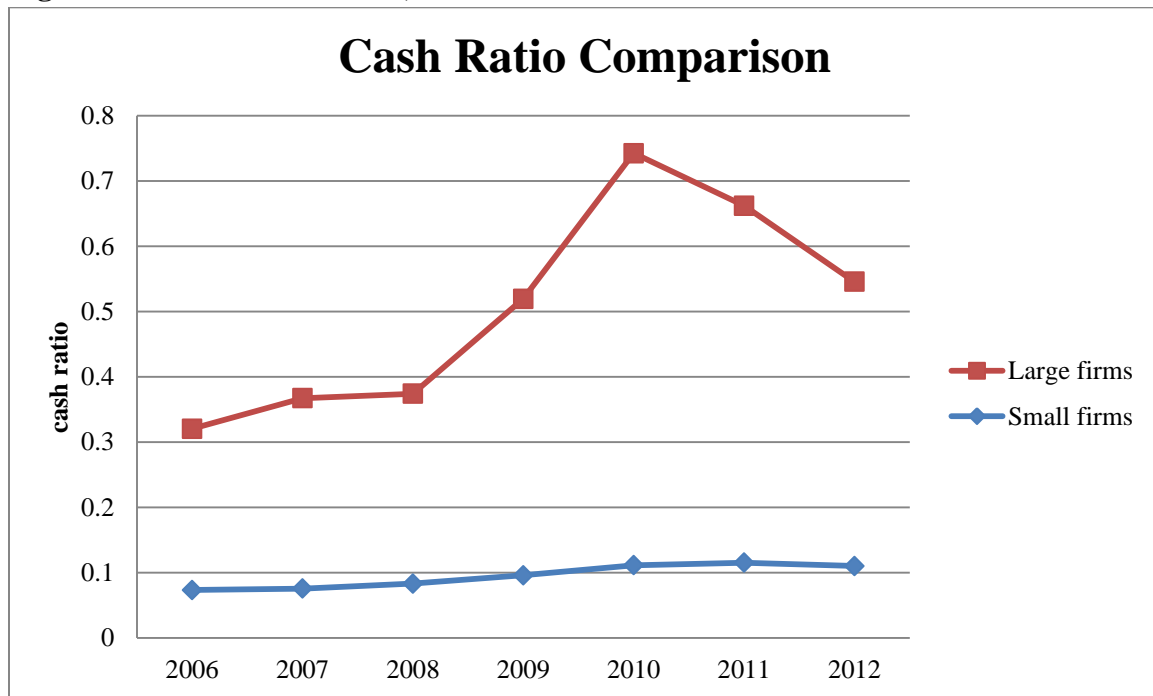
Table4. Average and median cash and leverage ratios for 2003-2012

Year	N	Aggregate cash ratio	Average cash ratio	Median cash ratio	Average leverage	Median leverage
2003	7	0.2304	0.2841	0.2058	0.7286	0.6370
2004	9	0.1133	0.1778	0.0620	0.8988	0.7409
2005	18	0.1296	0.1421	0.0687	1.3479	0.7752
2006	456	0.1377	0.1968	0.1349	0.5964	0.5763
2007	689	0.1333	0.2215	0.1504	0.7730	0.5579
2008	787	0.1305	0.2288	0.1527	0.6070	0.5521
2009	847	0.1460	0.3079	0.1780	0.6038	0.5432
2010	1029	0.1522	0.4272	0.2141	0.5427	0.5013
2011	1245	0.1457	0.3889	0.2093	0.4979	0.4569
2012	1376	0.1341	0.3286	0.2019	0.4831	0.4717

Figure 1 illustrates the average cash ratios for the firm size from 2006 to 2012.

The sample includes the observations from 2006 to 2012 with positive values of assets and no missing data for cash and cash equivalents in China. The cash ratio is measured as the ratio of cash and cash equivalents to the book value of total assets. Firms are sorted into quintiles based on the enterprise value. We define that firms with cash ratio below the median ratio are small firms, and firms with cash ratio above median are large firms. Then we use the mean of small and large firms for each year to represent the cash holding trends. The average cash ratio increases and decreases for both large firms and small firms during the same period, though the increase or decrease is more pronounced for large firms. The increase in the average cash ratio for the large firms is especially strong during 2006-2010 that covers financial crisis period, but decreased dramatically since 2010. We find this phenomenon is similar to the performance of US firms; Chinese firms tend to increase their cash holdings during financial crisis as compared to the normal times. Generally, firms that are more financially constrained, and with more investment opportunities, are more likely to have greater cash holdings. During financial crisis, firms are facing more risks and thus holding more cash for precautionary motives. Since 2010, the economic situation begins to look up, the cash holdings begin to decrease.

Figure1. Mean cash-to-assets, 2006-2012



Our study examines the relation between cash holdings and various controls for firm specific variables in a multivariate setting using regressions. Table 5 reports the results of our model, as a test for cash holdings. The dependent variable in all the regressions is the cash/assets ratio and natural log of cash/assets, which is calculated as cash divided by assets less cash holdings, and the independent variables are firm specific factors affecting cash holdings. The regression coefficients of different variables address the predictions of our hypotheses relating to cash ratios.

We test the hypotheses of cash holdings in China by the following models. First, we run OLS regression. Next, we run the OSL regression with the dependent variable of log of cash/assets. The third regression is year dummy regression by adding a dummy variable for each year in the period 2006-2012 into the OLS model.

Table5. Regression results of cash holdings from 2006-2012

	Model 1	Model 2	Model 3
INTERCET	0	0	1.0795
t-stat	0	0	0
TOBIN	0.0068	-0.0481	-0.0279
t-stat	-0.0256	0	0
FIRM SIZE	0.083	-0.0916	-0.1151
t-stat	0	0	0
CASH FLOW	0.0291	0.0734	0.0529
t-stat	0	0	0
NWC	-1.2594	-1.2508	-1.2112
t-stat	0	0	0
EXPENDITURE	1.2648	0.8023	1.2997
t-stat	0	0	0
LEVERAGE	-0.2114	-0.2313	-0.2009
t-stat	0	0	0
INDSIGMA	0.0003	-0.0536	-0.0207
t-stat	-0.9593	0	0.0009
R&D	-3.7335	-0.158	-3.5386
t-stat	0	0.7972	0
N	6463	6463	6463
ADJUSTED R^2	0.6241	0.6241	0.5076

The results demonstrate that as Tobin's Q increase, cash holdings increase in model one but decrease in the other two models. Following the literature review, we use Tobin's Q as a measure of investment opportunities. We expect cash holdings and cash flows sensitivities to have a positive correlation with Tobin's Q. So we are worried about that may be market-to-book ratio is not a good proxy for investment opportunities for Chinese firms. When we calculate Tobin's Q, we captures both the value of investment opportunities together with the probabilities that the firm will take the investment opportunities, but the probability may vary for different countries, especially for Chinese firms which most of the significant industries are state-owned or the major shareholder is government. So whether the enterprise will go into an investment or not is mostly decided by the national government considering of their interests and the economical

policies. Moreover, the market-to-book ratio is also affected by differences in the measurement of book assets. In China, we use CAS Plus as the principle of accounting, which is quite different from the US firms, we think this may also cause the Tobin's Q ineffective. The third factor we believe is the political interference and earnings manipulating in Chinese firms. Firms with greater state holdings and close relationship with the government are able to obtain bank loans more easily than firms with lower state holdings, due to state influence on the banks making the loans. Firms with higher state ownership have greater financial resources than firms with lower state ownership and less need to rely on rights issues to obtain capital.

In the first model, we don't use dummy variables for years. Capital expenditure and industry sigma have positive coefficients. The significance on of the coefficients on NWC, leverage and research and development expense is all negative. In both model one and model two, capital expenditure has positive and significant coefficients.

We next investigate whether the intercepts of the models change over time, identifying an increase in the cash ratio not explained by changes in modeled firm characteristics. We add year as one indicator dummy variable to the model allowing for intercept shifts in changes in firm characteristics.

The coefficients of these variables are consistent with the static trade of theory. Finally, the static trade of theory does not make clear predictions about the coefficient of leverage, but the result for this coefficient is consistent with the financing hierarchy model. To the extent that the evidence supports the static trade of model, it cannot be the case that cash holdings are a matter of indifference.

6. Conclusion

How to manage cash is important for corporations in China. Firms need to seek an optimal strategy with respect to cash management. In this study, we examine the determinants of corporate holdings of cash. We first found out that Chinese firms have the similar trend to US firms. Chinese firms tend to increase their cash holdings during financial crisis than the normal times. When firms are more financially constrained, they are more likely to hold more cash. Furthermore, firms with lower leverage, less net working capital (NWC), and lower capital expenditures, are more likely to increase cash holdings as well. But investment opportunity is not the only factor that has an influence on cash holdings. When it comes to investment opportunity, we have to take the economic policy of the country's government into consideration.

At the same time, however, it is also quite clear that variables that make debt costly for a firm are variables that make cash advantageous. Because the determinants of cash are so closely related to the determinants of debt in our analysis, it is important in future work to figure out, both theoretically and empirically, to what extent cash holdings and debt are two faces of the same coin.

Appendices

Appendix A

Table of statistic of key variable

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FIRM SIZE	5.614	5.533	0.595	2.285	8.538	4.960	5.167	5.345
CASHFLOW	0.177	0.059	9.472	-20.012	761.231	-0.032	0.008	0.030
NWC	-0.019	-0.009	0.252	-6.059	0.906	-0.317	-0.193	-0.112
CAPEX	-0.061	-0.045	0.057	-0.611	0.000	-0.141	-0.102	-0.079
LEVERAGE	0.568	0.519	1.684	0.018	123.982	0.212	0.324	0.416
R&D	-8.41E-04	0.00E+00	7.27E-03	-2.03E-01	2.82E-03	-3.37E-03	-1.68E-03	-1.12E-03

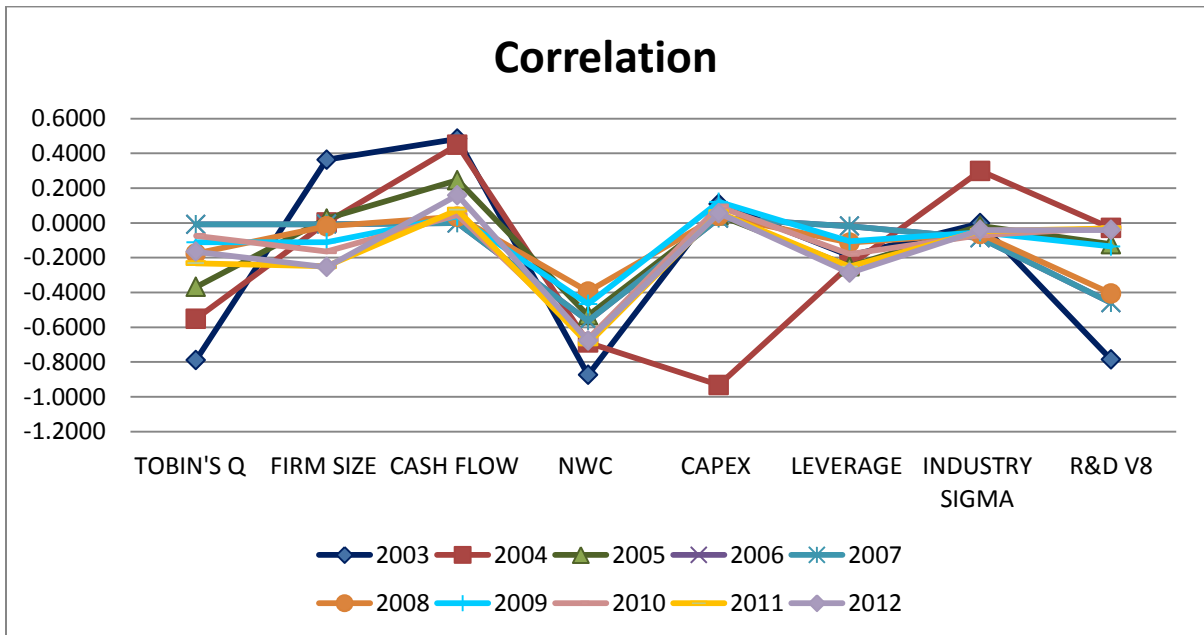
Because the calculation for cash ratio is cash and cash equivalent divided by the difference between total asset and cash and cash equivalent. This will be one possible reason that having a large number of cash ratio.

Appendix B

Table of correlation for each year from 2006-2012

	CASHRATIO Y									
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
TOBIN'S Q	-0.7892	-0.5516	-0.3683	0.0227	-0.0085	-0.1763	-0.1116	-0.0747	-0.2323	-0.1656
FIRM SIZE	0.3636	0.0026	0.0243	-0.0236	-0.0075	-0.0195	-0.1116	-0.1641	-0.2497	-0.2544
CASH FLOW	0.4843	0.4490	0.2458	0.1727	-0.0015	0.0353	0.0376	0.0448	0.0756	0.1592
NWC	-0.8750	-0.6889	-0.5318	-0.5960	-0.5633	-0.3953	-0.4669	-0.6675	-0.6943	-0.6770
CAPEX	0.1097	-0.9324	0.0428	0.0608	0.0267	0.0402	0.1205	0.0936	0.0604	0.0555
LEVERAGE	-0.1880	-0.2448	-0.2500	-0.1611	-0.0188	-0.1137	-0.1050	-0.1792	-0.2519	-0.2870
INDUSTRY SIGMA	-0.0023	0.2991	-0.0179	-0.0820	-0.0866	-0.0634	-0.0534	-0.0707	-0.0461	-0.0405
R&D V8	-0.7851	-0.0296	-0.1229	-0.6408	-0.4596	-0.4062	-0.1356	-0.0289	-0.0314	-0.0405

Because Tobin's Q represents the investment opportunities, the financial market in China was well performing in 2006, this create the opportunities for firms. Thus, the positive correlation appears in the table for 2006.



As mentioned in above, the correlation for large sample size years have similar trends.

Appendix C

Regression result of Cash ratio and leverage ratio

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.45501	0.06543	6.95389	0.00012	0.30412	0.60590	0.30412	0.60590
X Variable	-0.26081	0.08730	-2.98745	0.01740	-0.46212	-0.05949	-0.46212	-0.05949

It implies: Cash ratio = $0.45501 - 0.26081 * \text{Leverage ratio}$.

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